UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,443	03/18/2004	Renato Barrera	MS301563.01 / MSFTP576US	5417

27195　　　7590　　　11/20/2007	EXAMINER	
AMIN. TUROCY & CALVIN, LLP	KHAKHAR, NIRAV K	
24TH FLOOR, NATIONAL CITY CENTER		
1900 EAST NINTH STREET	ART UNIT	PAPER NUMBER
CLEVELAND, OH 44114	2167	

NOTIFICATION DATE	DELIVERY MODE
11/20/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket1@thepatentattorneys.com
hholmes@thepatentattorneys.com
osteuball@thepatentattorneys.com

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	10/803,443	BARRERA ET AL.
	Examiner	**Art Unit**	
	Nirav K. Khakhar	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2007*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-11,13-15 and 17-42* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-11,13-15 and 17-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Remarks

1.   Examiner acknowledges applicants' reply dated July 12, 2007.

2.   Examiner acknowledges amendments made to Claims 1, 10, 14, 15, 17, 19, 21, 23, 34, and 39; cancellation of Claims 7, 12, and 16; and addition of new Claims 41 and 42.

3.   Examiner acknowledges the amendment to Claim 17 designed to overcome the previously made objection due to minor informalities, and withdraws that objection.

4.   Examiner acknowledges the amendment to Claim 36 designed to overcome the previously made rejection under 35 U.S.C. § 112, second paragraph, and withdraws that rejection.

5.   Examiner acknowledges the amendments to Claims 1, 10, and 34 designed to overcome the previously made rejection under 35 U.S.C. § 101, and withdraws that rejection.

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1, 6, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, et al., U.S. Pat. No. 6,088,524 (hereafter, "Levy"), in view of IBM Technical

Disclosure Bulletin, March 1990, "Multiple Indexed Access Path in a Relational

Database System", Vol. 32, Iss. 10B, pp. 388 – 392 (hereafter, "IBM").

As to **Claim 1**, Levy discloses: a system that facilitates query optimization in a

data repository, comprising the following computer-executable components

stored in a computer memory: a query component that receives a query to be

processed against data of the data repository, which query includes an original

predicate (col. 1, lines 28 – 36, referring to a query that includes a predicate

being posed to a relational database); and

a metadata engine that generates one or more implied predicates based on at

least an existing rule for a column or function on a column and one or more

indices that can be exploited (col. 6, lines 13 – 65, referring to a framework that

generates inferred predicates based on functions of columns); and

a predicate component that processes the original predicate into one or more

new predicates that include an implied predicate, the implied predicate

processed against the data to return a best solution such that a total evaluation cost is significantly reduced (col. 5, lines 14 – 24, referring to the system being used to optimize query resolution).

Levy does not appear to explicitly disclose the implied predicate being selected from one or more implied predicates based at least on a determination of the predicate being used in index-seek operation or covered by contents of the one or more indices.

IBM discloses: the implied predicate being selected from one or more implied predicates based at least on a determination of the predicate being used in index-seek operation or covered by contents of the one or more indices (Part 1, referring to an implied predicate being chosen by searching among the predicates for the best predicates on index keys to derive the best strategy of single index access).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy and IBM before him/her to have modified the system of Levy with the basis for choosing the best predicate from IBM, in order to derive a best strategy for query optimization.

As to **Claim 6**, Levy, as modified, discloses: the one or more new predicates

being considered cost-based alternatives that are utilized only if the evaluation

cost is reduced, otherwise, they are discarded (Levy, Fig. 9, Item 94, showing

new predicates that are not useful in optimization being discarded).

As to **Claim 9**, Levy, as modified, discloses: a data repository optimizer

according to the system of claim 1 (Levy, col. 6, lines 53 – 67, referring to such

an optimizer).

8.   Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy, in

view of IBM, further in view of Larson, et al., U.S. Pat. No. 6,381,616 (hereafter, "Larson

'616").

As to **Claim 2**, Levy, as modified, does not appear to explicitly disclose the

limitation of predicate component processing the original predicate to obtain an

equivalent predicate.

Larson '616 discloses: predicate component processing the original predicate to

obtain an equivalent predicate (col. 11, lines 13 – 17, allowing the query

processor to obtain from the query the same results that would have been

returned had the query not been optimized).

It would have been obvious to one having ordinary skill in this art at the time of
the invention, having the teachings of Levy, IBM and Larson '616 before him/her,
to have further modified the system of Levy with the equivalent predicates of
Larson '616, in order to obtain from the query the same results that would have
been returned had the query not been optimized.

9.   Claims 3 – 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over
Levy, in view of IBM, further in view of Larson, et al., U.S. PG-Pub. No. 2003/0093415
(hereafter, "Larson '415").

As to **Claim 3**, Levy, as modified, does not appear to explicitly disclose the
limitation of: the predicate component processing the original predicate to obtain
a residual predicate.

Larson '415 discloses: the predicate component processing the original predicate
to obtain a residual predicate ([0089], ensuring that unused predicates are
maintained).

It would have been obvious to one having ordinary skill in this art at the time of
the invention, having the teachings of Levy, IBM, and Larson '415 before him/her,
to have further modified the system of Levy with the residual predicates of Larson

'415, in order to ensure that unused predicates are maintained in the query processing.

As to **Claim 4**, Levy, as modified, does not appear to explicitly disclose the limitation of: the query being a previously processed query that is unmatched.

Larson '415 discloses: the query being a previously processed query that is unmatched ([0089], ensuring that unused predicates are maintained).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, IBM, and Larson '415 before him/her, to have further modified the system of Levy with the residual predicates of Larson '415, in order to ensure that unused predicates are maintained in the query processing.

As to **Claim 5**, Levy, as modified, does not appear to explicitly disclose the limitation of: the one or more new predicates able to be used for standard indices and multi-valued indices.

Larson '415 discloses: the one or more new predicates able to be used for standard indices and multi-valued indices ([0134], allowing a newly created predicate to be used for building and searching a lattice index).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, and Larson '415 before him, to

have further modified the system of Levy with the standard and multi-valued

index use of Larson '415, in order to allow a newly created predicate to be used

for building and searching a lattice index.

10.   Claims 8 and 42 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, in view of IBM, further in view of Dessloch, et al., U.S. Pat. No. 6,338,056

(hereafter, "Dessloch").

As to **Claim 8**, Levy, as modified, does not appear to explicitly disclose the

limitation of the query being processed against a data type that is a non-

indexable type.

Dessloch discloses: the query being processed against a data type that is a non-

indexable type (col. 13, lines 47 – 56, allowing data types that are not indexable

to be indexed and queried).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, and Dessloch before him/her, to

have further modified the system of Levy with the type-indexability of Dessloch,

in order to make non-indexable data types indexable and able to be queried.

As to **Claim 42**, Levy, as modified, does not appear to explicitly disclose: the

metadata component employing an indexed computed column that utilizes the

column when the column is non-indexable.

Dessloch discloses: the metadata component employing an indexed computed

column that utilizes the column when the column is non-indexable (col. 13, lines

47 – 56, allowing data types that are not indexable to be indexed and queried).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, and Dessloch before him/her, to

have further modified the system of Levy with the type-indexability of Dessloch,

in order to make non-indexable data types indexable and able to be queried.

11.   Claims 10 – 11, 13 – 15, and 17 - 18 are rejected under 35 U.S.C. § 103(a) as

being unpatentable over Levy, in view of IBM, Larson '616, and Larson '415.

As to **Claim 10**, Levy discloses: a system that facilitates query optimization in a

data repository, comprising: a query component that receives a query to be

processed against data of the data repository, which query includes an original

predicate (col. 1, lines 28 – 36, referring to a query that includes a predicate

being posed to a relational database); and

a metadata engine that generates one or more implied predicates based on at

least an existing rule for a column or function on a column and one or more

indices that can be exploited (col. 6, lines 13 – 65, referring to a framework that

generates inferred predicates based on functions of columns); and

a predicate component that processes the original predicate into one or more

new predicates that include an implied predicate, the implied predicate is

processed against the data to return a best solution such that a total evaluation

cost is significantly reduced (col. 5, lines 14 – 24, referring to the system being

used to optimize query resolution).

Levy does not appear to explicitly disclose the limitations of the predicate

component processing the original predicate in to one or more new predicates

that include an equivalent predicate and a residual predicate, the equivalent

predicate being selected from one or more implied predicates based at least on a

determination of the predicate being used in index-seek operation or covered by

contents of the one or more indices.

Larson '616 discloses: the predicate component processing the original predicate

in to one or more new predicates that include an equivalent predicate, (col. 11,

lines 13 – 17, allowing the query processor to obtain from the query the same results that would have been returned had the query not been optimized).

Larson '616 does not appear to explicitly disclose the limitation of the predicate component processing the original predicate in to one or more new predicates that include a residual predicate, and the equivalent predicate being selected from one or more implied predicates based at least on a determination of the predicate being used in index-seek operation or covered by contents of the one or more indices.

Larson '415 discloses: the predicate component processing the original predicate in to one or more new predicates that include a residual predicate ([0089], ensuring that unused predicates are maintained).

Larson '415 does not appear to explicitly disclose: the equivalent predicate being selected from one or more implied predicates based at least on a determination of the predicate being used in index-seek operation or covered by contents of the one or more indices.

IBM discloses: the implied predicate being selected from one or more implied predicates based at least on a determination of the predicate being used in index-seek operation or covered by contents of the one or more indices (Part 1,

referring to an implied predicate being chosen by searching among the predicates for the best predicates on index keys to derive the best strategy of single index access).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, Larson '415, and IBM before him/her, to have modified the system of Levy with the equivalent predicates and residual predicates of Larson '616 and Larson '415 (respectively), and the basis for choosing predicates from IBM, in order to allow the query processor to obtain from the query the same results that would have been returned had the query not been optimized and to ensure that unused predicates are maintained in the query processing and to derive a best strategy for query optimization.

As to **Claim 11**, Levy, as modified, discloses the implied predicate and the equivalent predicate being considered cost-based alternatives that are discarded if the evaluation cost is not reduced (Levy, Fig. 9, Item 94, showing new predicates that are not useful in optimization being discarded).

As to **Claim 13**, Levy, as modified, discloses: a server that employs the system of claim 10 (Larson '616, col. 6, lines 56 – 67).

As to **Claim 14**, Levy, as modified, discloses: the predicate component

generating an expression using the one or more new predicates, which

expression is used to obtain the implication rule that is associated with at least

one of the given column or the function on a given column (Larson '415, [0042]).

As to **Claim 15**, Levy, as modified, discloses: the predicate component

requesting the implication rule in response to providing the expression to which

at least one of the given column or the function on a given column is to be

compared, and a list of standard indices that can be exploited (Larson '415,

[0042]).

As to **Claim 17**, Levy, as modified, discloses: a classifier that facilitates

automating one or more features by making an inference based on one or more

parameters related to at least one of a cost-based evaluation, cardinality

estimation, and complexity of the query (Levy, Fig. 9).

As to **Claim 18**, Levy, as modified, discloses: the total evaluation cost includes

employing the one or more new predicates only if optimization is increased

(Levy, Fig. 9).

12.   Claim 20 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy, in view of IBM, Larson '616, and Larson '415, further in view of Reiner, et al., U.S. Pat. No. 5,742,806 (hereafter, "Reiner").

       Levy, as modified, does not appear to explicitly disclose the limitation of the one or more new predicates being analyzed during index selection.

       Reiner discloses: the one or more new predicates being analyzed during index selection (col. 98, lines 41 – 53, increasing efficiency if more than one index is available for the query).

       It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, IMB, Larson '616, Larson '415, and Reiner before him/her, to have further modified the system of Levy with the timing of predicate analysis of Reiner, in order to increase efficiency in the event that a plurality of indices are available to the query.

       As to **Claim 20**, Levy, as modified, does not appear to explicitly disclose the limitation of: the implied predicate exactly matching an index key.

       Reiner discloses: the implied predicate exactly matching an index key (col. 43, increasing the usefulness of the new predicate).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, Larson '616, Larson '415, and

Reiner before him/her, to have further modified the system of Levy with the

predicate-key matching of Reiner, in order to increase the usefulness of the new

predicate.

13.   Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy,

in view of IBM, Larson '616 and Larson '415, further in view of Lin, et al., U.S. Pat. No.

6,675,159 (hereafter, "Lin").

Levy, as modified, does not appear to explicitly disclose the limitation of: the

query being one for which there is no exact match between search predicates

and index keys.

Lin discloses: the query being one for which there is no exact match between

search predicates and index keys (col. 21, lines 19 – 21, increasing versatility of

the query optimizer).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, Larson '616, Larson '415, and

Lin before him/her, to have further modified the system of Levy with the query

attributes of Lin, in order to increase the versatility of the query optimizer.

14.   Claims 21 and 31 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, in view of IBM, Larson '616, and Lin.

As to **Claim 21**, Levy discloses: a computer-readable medium having computer-

executable instructions for performing a method for optimizing a search query

(col. 6, lines 53 – 67), the method comprising:

reducing the original predicate into at least an implied predicate (col. 5, lines 14 –

24);

processing the implied predicate against data of a data repository to obtain

search results (Fig. 4, showing a query with an implied predicate being

processed); and

analyzing the search results to output a best solution (Fig. 9).

Levy does not appear to explicitly disclose: receiving a query for whose original

predicate there is no exact match to an index key; reducing the original predicate

into an equivalent predicate, or processing the equivalent predicate against data

of a data repository to obtain search results based at least on an implication rule

for a column or function on a column being compared and one or more indices;

or the analysis being based at least on a determination that the implied predicate

or the equivalent predicate is used in index-seek operation or covered by

contents of one or more indices.

Lin discloses: receiving a query for whose original predicate there is no exact

match to an index key (col. 21, lines 19 – 21, increasing versatility of the query

optimizer).

Lin does not appear to explicitly disclose: reducing the original predicate into an

equivalent predicate, or processing the equivalent predicate against data of a

data repository to obtain search results based at least on an implication rule for a

column or function on a column being compared and one or more indices; or the

analysis being based at least on a determination that the implied predicate or the

equivalent predicate is used in index-seek operation or covered by contents of

one or more indices.

Larson '616 discloses: reducing the original predicate into an equivalent

predicate, or processing the equivalent predicate against data of a data

repository to obtain search results (col. 11, lines 13 – 17, allowing the query

processor to obtain from the query the same results that would have been

returned had the query not been optimized).

Larson '616 does not appear to explicitly disclose: obtaining results being based

at least on an implication rule for a column or function on a column being

compared and one or more indices; or the analysis being based at least on a

determination that the implied predicate or the equivalent predicate is used in

index0seek operation or covered by contents of one or more indices.

IBM discloses: obtaining results based at least on an implication rule for a

column or function on a column being compared and one or more indices; and

the analysis being based at least on a determination that the implied predicate or

the equivalent predicate is used in index0seek operation or covered by contents

of one or more indices (Part 1, referring to an implied predicate being chosen by

searching among the predicates for the best predicates on index keys to derive

the best strategy of single index access).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM Lin, and Larson '616 before

him/her to have modified the system of Levy with the lack of exact matching of

Lin, the equivalent predicates of Larson '616, and the predicate choosing basis of

IBM, in order to increase the versatility of the query optimizer, to allow the query

processor to obtain from the query the same results that would have been

returned had the query not been optimized, and to derive a best strategy for

query optimization.

As to **Claim 31**, Levy, as modified, discloses: replacing the original predicate with

the equivalent predicate and searching for the best solution (Larson '616, col. 11,

lines 13 – 17).

15.   Claims 22 – 24, 28, 29, 34, 38, and 39 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Levy, in view of IBM, Larson '616, and Lin, further in view of

Larson '415.

As to **Claim 22**, Levy, as modified, does not appear to explicitly disclose:

requesting an implication rule for a column or function on a column.

Larson '415 discloses: requesting an implication rule for a column or function on

a column (Larson '415, [0042], increasing the accuracy of the new predicate).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, Larson '616, Lin, and Larson

'415 before him/her, to have further modified the system of Levy with the column-

based rule request of Larson '415, in order to increase the accuracy of the new

predicate.

As to **Claim 23**, Levy, as modified, does not appear to explicitly disclose transmitting at least one of an expression to which the column or the function on a column is to be compared and a list of standard indices or multi-valued indices that could be exploited.

Larson '415 discloses: transmitting at least one of an expression to which a column or function on a column is to be compared and a list of standard indices or multi-valued indices that could be exploited (Larson '415, [0042], increasing the accuracy of the new predicate).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, Lin, and Larson '415 before him/her, to have further modified the system of Levy with the column-based rule request of Larson '415, in order to increase the accuracy of the new predicate.

As to **Claim 24**, Levy, as modified, discloses removing the implied predicate if the implied predicate does not meet certain requirements (Levy, Fig. 9).

Levy, as modified, does not appear to explicitly disclose the limitation of: the said requirements being the exploitation of one of the standard or multi-value indices.

Larson '415 discloses: the said requirements being the exploitation of one of the standard or multi-value indices (Larson '415, [0042], increasing the accuracy of the new predicate).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, IBM, Larson '616, Lin, and Larson '415 before him/her, to have further modified the system of Levy with the column-based rule request of Larson '415, in order to increase the accuracy of the new predicate.

As to **Claim 28**, Levy, as modified, does not appear to explicitly disclose the limitation of: processing the original predicate to generate a residual predicate that refines the search.

Larson '415 discloses: processing the original predicate to generate a residual predicate that refines the search (Larson '415, [0089], ensuring that unused predicates are maintained).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, IBM, Larson '616, Lin, and Larson '415 before him/her, to have further modified the system of Levy with the residual predicates of Larson '415, to ensure that unused predicates are maintained.

As to **Claim 29**, Levy, as modified, does not appear to explicitly disclose:

processing the residual predicate after the act of processing at least one of the

implied predicate and the equivalent predicate.

Larson '415 discloses: processing the residual predicate after the act of

processing at least one of the implied predicate and the equivalent predicate

(Larson '415, [0089], ensuring that unused predicates are maintained).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, Larson '616, Lin, and Larson

'415 before him/her, to have further modified the system of Levy with the residual

predicates of Larson '415, to ensure that unused predicates are maintained.

As to **Claim 34**, Levy discloses: a system that facilitates query optimization in a

data repository; comprising following means stored in a computer memory:

means for reducing the original predicate into an implied predicate (Levy, col. 5,

lines 14 – 24);

means for processing the implied predicate against data of a data repository to

obtain search results (Levy, Fig. 4);

means that analyzes the search results and outputs a best solution (Levy, Fig. 9).

Levy does not appear to explicitly disclose: means for receiving a query for

whose original predicate there is no exact match to an index key; means for

reducing the original predicate into an equivalent predicate; means for requesting

an implication rule for a column or function on a column; means for transmitting

at least one of an expression to which a column or function on a column is to be

compared and a list of standard indices or multi-valued indices that could be

exploited; means for processing the equivalent predicate against data of a data

repository to obtain search results; or the best solution being based at least on a

determination that the implied predicate or the equivalent predicate is used in

index-seek operation or covered by contents of the standard or multi-valued

indices.

Larson '415 discloses: means for requesting an implication rule for a column or

function on a column (Larson '415, [0042]); means for transmitting at least one of

an expression to which a column or function on a column is to be compared and

a list of standard indices or multi-valued indices that could be exploited (Larson

'415, [0042]); and the said requirements for removing the implied predicate being

exploitation of one of the standard or multi-value indices (Larson '415, [0042], all

of which increase the accuracy of the new predicate).

Larson '415 does not appear to explicitly disclose: means for receiving a query

for whose original predicate there is no exact match to an index key; means for

reducing the original predicate into an equivalent predicate; or the best solution being based at least on a determination that the implied predicate or the equivalent predicate is used in index-seek operation or covered by contents of the standard or multi-valued indices.

Larson '616 discloses: means for reducing the original predicate into an equivalent predicate (Larson '616, Larson '616, col. 11, lines 13 – 17); and means for processing the equivalent predicate against data of a data repository to obtain search results (Larson '616, col. 11, lines 13 – 17, allowing the query processor to obtain from the query the same results that would have been returned had the query not been optimized).

Larson '616 does not appear to explicitly disclose: means for receiving a query for whose original predicate there is no exact match to an index key or the best solution being based at least on a determination that the implied predicate or the equivalent predicate is used in index-seek operation or covered by contents of the standard or multi-valued indices

Lin discloses: means for receiving a query for whose original predicate there is no exact match to an index key (Lin, Lin, col. 21, lines 19 – 21, increasing versatility of the query optimizer).

Lin does not appear to explicitly disclose: the best solution being based at least on a determination that the implied predicate or the equivalent predicate is used in index-seek operation or covered by contents of the standard or multi-valued indices.

IBM discloses: the best solution being based at least on a determination that the implied predicate or the equivalent predicate is used in index-seek operation or covered by contents of the standard or multi-valued indices (Part 1, referring to an implied predicate being chosen by searching among the predicates for the best predicates on index keys to derive the best strategy of single index access).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, IBM, Larson '415, Larson '616, and Lin before him/her, to have modified the system of Levy with the column functions and multi-valued indices of Larson '415, the equivalent predicates of Larson '616; the lack of exact matching from Lin, and the basis for choosing the best predicate from IBM, in order to increase the accuracy of the new predicate, allow the query processor to obtain from the query the same results that would have been returned had the query not been optimized; to increase the versatility of the query optimizer, and to derive a best strategy for query optimization.

As to **Claim 38**, Levy, as modified, discloses: means for processing the original

predicate to generate a residual predicate that refines the search (Larson '415,

[0089]).

As to **Claim 39**, Levy, as modified, discloses: means for processing the residual

predicate after processing at least one of the implied predicate and the

equivalent predicate (Larson '415, [0089]).

16.   Claims 25 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, in view of Larson '616, IBM, and Lin, and further in view of Pauschine, et al.,

U.S. Pat. No. 5,918,232 (hereafter, "Pauschine").

As to **Claim 25**, Levy, as modified, does not appear to explicitly disclose:

employing a new ad-hoc exploratory rule for an individual operator of the original

predicate.

Pauschine discloses: employing a new ad-hoc exploratory rule for an individual

operator of the original predicate (col. 18, lines 58 – 67, enabling versatility of

rules and predicates).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, IBM, Larson '616, Lin, and

Pauschine before him/her, to have further modified the system of Levy with the

employment of ad-hoc rules from Pauschine, in order to enable versatility of rules

and predicates.

As to **Claim 26**, Levy, as further modified, discloses: analyzing at least one of the

implied predicate and the equivalent predicate with the exploratory rule

(Pauschine, col. 18, lines 58 – 67).

17.   Claims 27 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, in view of Larson '616, IBM, and Lin, further in view of Paulley, et al., U.S.

Pat. No. 6,665,664 (hereafter, "Paulley").

As to **Claim 27**, Levy, as modified, does not appear to explicitly disclose:

requesting a list of tentative substitutes with predicates that involve nested

queries; including the substitutes into the query to form a new expression;

simplifying the new expression; removing nested queries; or generating new

alternatives for the search.

Paulley discloses: requesting a list of tentative substitutes with predicates that

involve nested queries (Paulley, col. 13, lines 1 – 13); including the substitutes

into the query to form a new expression; simplifying the new expression (Paulley,

col. 13, lines 1 – 13); removing nested queries; and generating new alternatives

for the search (Paulley, col. 17, lines 48 – 64, supplying an additional method of simplifying a complex query).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, IBM, Lin, and Paulley before him/her to have further modified the system of Levy with the substitution and replacement of predicates from Paulley, in order to supply an additional method of simplifying a complex query.

As to **Claim 30**, Levy, as modified, does not appear to explicitly disclose: adding the implied predicate to the original predicate and searching for the best solution.

Paulley discloses: adding the implied predicate to the original predicate and searching for the best solution (Paulley, col. 13, lines 1 – 13, and col. 17, lines 48 – 64, supplying an additional method of optimizing a query).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, Lin, IBM, and Paulley before him/her to have further modified the system of Levy with the concatenation of predicates from Paulley, in order to supply an additional method of optimizing a query.

18.   Claim 32 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy, in view of Larson '616, IBM, and Lin, further in view of Reiner.

As to **Claim 32**, Levy, as modified, does not appear to explicitly disclose: performing a cardinality estimation using at least one of the implied predicate and the equivalent predicate.

Reiner discloses: performing a cardinality estimation using at least one of the implied predicate and the equivalent predicate (Reiner, col. 104, lines 25 – 35, determining the effectiveness of the new predicates).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, Lin, IBM, and Reiner before him/her, to have further modified the system of Levy with the cardinality estimates of Reiner, in order to determine the effectiveness of the new predicates.

19.   Claim 33 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy, in view of Larson '616, IBM, and Lin, further in view of Leslie, et al., U.S. Pat. No. 5,778,354 (hereafter, "Leslie").

As to **Claim 33**, Levy, as modified, does not appear to explicitly disclose: creating an index based on an index extension scheme, which scheme includes at least one of, providing a key column of a data type that corresponds to a data type being indexed; providing a set of parameters; and providing a table-valued function name that is used to generate an index entry for a value of the column being indexed.

Leslie discloses: creating an index based on an index extension scheme, which scheme includes at least one of, providing a key column of a data type that corresponds to a data type being indexed; providing a set of parameters; and providing a table-valued function name that is used to generate an index entry for a value of the column being indexed (Leslie, col. 1, lines 21 – 37, enabling pertinent records to be accessed at a minimum cost).

It would have been obvious to one having ordinary skill in this art at the time of the invention, having the teachings of Levy, Larson '616, Lin, IBM, and Lesle before him/her, to have further modified the system of Levy with the indexing scheme of Leslie, in order to enable pertinent records to be accessed at a minimum cost.

20.   Claims 35 and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, Larson '616, Larson '415, IBM, and Lin, as applied to Claim 34 above, further

in view of Pauschine.

As to **Claim 35**, Levy, as modified, does not appear to explicitly disclose: means

for employing a new ad-hoc exploratory rule for an individual operator of the

original predicate.

Pauschine discloses: means for employing a new ad-hoc exploratory rule for an

individual operator of the original predicate (Pauschine, col. 18, lines 58 – 67,

enabling versatility of rules and predicates).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, Larson '616, Larson '415, Lin, IBM,

and Pauschine before him/her, to have further modified the system of Levy with

the employment of ad-hoc rules from Pauschine, in order to enable versatility of

rules and predicates.

As to **Claim 36**, Levy, as modified, discloses: means for analyzing at least one of

the implied predicate and the equivalent predicate with the exploratory rule

(Pauschine, col. 18, lines 58 – 67).

21.   Claim 37 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Levy,

Larson '616, Larson '415, IBM, and Lin, further in view of Paulley.

        As to **Claim 37**, Levy, as modified, does not appear to explicitly disclose: means

        for requesting a list of tentative substitutes with predicates that involve nested

        queries; means for including the substitutes into the query to form a new

        expression; means for simplifying the new expression; means for removing

        nested queries; and means for generating new alternatives for the search.

        Paulley discloses: means for requesting a list of tentative substitutes with

        predicates that involve nested queries (Paulley, col. 13, lines 1 – 13); means for

        including the substitutes into the query to form a new expression; simplifying the

        new expression (Paulley, col. 13, lines 1 – 13); means for removing nested

        queries; and means for generating new alternatives for the search (Paulley, col.

        17, lines 48 – 64, supplying an additional method of simplifying a complex query).

        It would have been obvious to one having ordinary skill in this art at the time of

        the invention, having the teachings of Levy, Larson '616, Larson '415, Lin, IBM,

        and Paulley before him/her to have further modified the system of Levy with the

        substitution and replacement of predicates from Paulley, in order to supply an

        additional method of simplifying a complex query.

22.   Claims 40 and 41 are rejected under 35 U.S.C. § 103(a) as being unpatentable

over Levy, Larson '616, Larson '415, IBM, and Lin, further in view of Reiner.

As to **Claim 40**, Levy, as modified, does not appear to explicitly disclose: means

for estimating cardinality using at least one of the implied predicate and the

equivalent predicate, where use of the implied predicate facilitates defining an

upper bound on a number of rows that can satisfy the original predicate.

Reiner discloses: means for estimating cardinality using at least one of the

implied predicate and the equivalent predicate, where use of the implied

predicate facilitates defining an upper bound on a number of rows that can satisfy

the original predicate (Reiner, col. 104, lines 25 – 35, determining the

effectiveness of the new predicates).

It would have been obvious to one having ordinary skill in this art at the time of

the invention, having the teachings of Levy, Larson '616, Lin, IBM, and Reiner

before him/her, to have further modified the system of Levy with the cardinality

estimates of Reiner, in order to determine the effectiveness of the new

predicates.

As to **Claim 41**, Levy, as modified, discloses: means for removing the implied

predicate if the implied predicate does not exploit one of the standard or multi-

value indices (Larson '415, [0042], increasing the accuracy of the new predicate).

Response to Arguments

23.   Applicant's arguments with respect to all claims have been considered but are

moot in view of the new ground(s) of rejection.

Conclusion

24.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nirav K. Khakhar whose telephone number is (571) 270-1004. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nirav K Khakhar
Examiner
Art Unit 2167

nk

Primary Examiner
Art Unit 2167